

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (previously presented) An interbody spinal implant for insertion between adjacent vertebral bodies of a human spine, said implant comprising:
 - a leading end for introduction of said spinal implant into the spine, an opposite trailing end, spaced apart sides therebetween, and a mid-longitudinal axis passing through said leading and trailing ends;
 - opposite upper and lower surfaces between said leading and trailing ends and said spaced apart sides, said upper surface adapted for placement in engagement with the bone of one of the vertebral bodies and said opposite lower surface adapted for placement in engagement with the bone of the other of the vertebral bodies when said implant is placed between the adjacent vertebral bodies; and
 - a plurality of surface projections formed on said upper and lower surfaces of said implant, at least a first and a second of said surface projections each having at least one forward facing facet directed at least in part toward said leading end, at least one rearward facet directed at least in part toward said trailing end, and opposed side facets directed generally toward said sides of said implant, said side facets each having a perimeter with a base, each of said forward facet and rearward facet having a length and a slope, the length of said forward facet being longer than the length of said rearward facet, each of said forward facets having a perimeter with a base, said base of said perimeter of each of said side facets being longer than said base of said perimeter of said forward facet, the slope of said rearward facet being steeper than the slope of said forward facet, at least a portion of said rearward facet of said first surface

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Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

projection overlying a portion of said forward facet of said second surface projection.

Claim 2 (cancelled).

3. (original) The spinal implant of claim 1, wherein said rearward facet is at an angle to at least one of said upper and lower surfaces of said implant.

Claim 4 (cancelled).

5. (original) The spinal implant of claim 3, wherein said angle is greater than 90 degrees.

Claims 6-18 (cancelled).

19. (previously presented) The spinal implant of claim 1, wherein said surface projections are oriented relative to one another to form an array.
20. (previously presented) The spinal implant of claim 1, wherein said surface projections are geometrically disposed relative to one another.
21. (original) The spinal implant of claim 1, wherein said upper and lower surfaces of said implant are at least in part arcuate.
22. (original) The spinal implant of claim 1, wherein at least one of said leading end, trailing end, and sides are curved.
23. (original) The spinal implant of claim 1, wherein said sides are curved.
24. (original) The spinal implant of claim 1, wherein each of said leading end, trailing end, and sides are curved.
25. (original) The spinal implant of claim 24, wherein said leading end, trailing end, and sides form a circle.
26. (original) The spinal implant of claim 1, wherein said upper and lower surfaces of said implant are at least in part planar.
27. (previously presented) The spinal implant of claim 1, wherein said upper and lower surfaces converge toward each other along at least a portion of the length of said implant.

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

28. (original) The spinal implant of claim 1, wherein said implant comprises a material other than bone.
29. (original) The spinal implant of claim 1, wherein said implant comprises bone.
30. (original) The spinal implant of claim 29, wherein said bone includes cortical bone.
31. (original) The spinal implant of claim 1, wherein said implant comprises bone growth promoting material.
32. (previously presented) The spinal implant of claim 31, wherein said bone growth promoting material is one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
33. (original) The spinal implant of claim 1, wherein said implant is treated with a bone growth promoting substance.
34. (original) The spinal implant of claim 1, wherein said implant is a source of osteogenesis.
35. (original) The spinal implant of claim 1, wherein said implant is at least in part bioabsorbable.
36. (original) The spinal implant of claim 1, wherein said implant comprises metal.
37. (original) The spinal implant of claim 36, wherein said metal is ASTM material suitable for use as a spinal fusion implant.
38. (original) The implant of claim 36, wherein said metal includes titanium.
39. (original) The implant of claim 1, wherein said implant comprises a plastic material.
40. (original) The implant of claim 1, wherein said implant comprises a ceramic material.
41. (original) The implant of claim 1, wherein said implant is formed of a porous material.

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

42. (original) The implant of claim 1, wherein said implant is formed of a material that intrinsically participates in the growth of bone from one of the adjacent vertebral bodies to the other of the adjacent vertebral bodies.
43. (original) The spinal implant of claim 1, wherein said implant is a motion preserving device adapted to space apart and allow motion between the adjacent vertebral bodies.
44. (original) The spinal implant of claim 1, wherein said spinal implant is a fusion implant.
45. (previously presented) The spinal implant of claim 44, wherein said upper and lower surfaces include at least one opening to permit bone growth from adjacent vertebral body to adjacent vertebral body through said implant.
46. (original) The spinal implant of claim 44, wherein said implant has an internal chamber and an access opening for accessing said internal chamber.
47. (original) The spinal implant of claim 46, wherein said implant has a cap for closing said access opening.
48. (previously presented) The spinal implant of claim 46, wherein said upper and lower surfaces include at least one opening in communication with said internal chamber to permit bone growth from adjacent vertebral body to adjacent vertebral body through said implant.
49. (original) The spinal implant of claim 46, wherein said internal chamber is capable of containing bone growth promoting material.
50. (previously presented) The spinal implant of claim 49, wherein said bone growth promoting material is one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
51. (original) The spinal implant of claim 1, further comprising at least one opening capable of retaining fusion promoting materials.
52. (withdrawn) The spinal implant of claim 1, further comprising at least one cut cleaving said surface projection into at least two portions.

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

- 53. (withdrawn) The spinal implant of claim 52, further comprising at least a second cut cleaving said surface projection into at least four portions.
- 54. (withdrawn) The spinal implant of claim 52, where said cut penetrates said surface projection at a depth substantially equal to that of the height of said surface projection.
- 55. (withdrawn) The spinal implant of claim 53, where said second cut penetrates said surface projection at a depth substantially equal to that of the height of said surface projection.
- 56. (withdrawn) The spinal implant of claim 52, wherein said cut is oriented along one of the mid-longitudinal axis of said implant, an axis perpendicular to the mid-longitudinal axis of said implant, and an axis at an angle between the mid-longitudinal axis and the axis perpendicular to the mid-longitudinal axis of said implant.

Claims 57-202 (cancelled).

- 203. (previously presented) The spinal implant of claim 1, in combination with a fusion promoting substance.
- 204. (previously presented) The spinal implant of claim 203, wherein said fusion promoting substance includes at least one of bone, bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.

Claims 205-206 (cancelled)

- 207. (previously presented) The spinal implant of claim 1, wherein each of said first and second surface projections have a base that is adjacent to one another.
- 208. (previously presented) The spinal implant of claim 1, wherein each of said first and second surface projections have a base, said bases being spaced apart from one another along a direction generally parallel to the mid-longitudinal axis of said implant.
- 209. (previously presented) The spinal implant of claim 1, wherein each of said first and second surface projections have a base, said bases being spaced apart

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

from one another along a direction generally transverse to the mid-longitudinal axis of said implant.

Claims 210-218 (cancelled).

219. (previously presented) An interbody spinal implant for insertion between adjacent vertebral bodies of a human spine, said implant comprising:

a leading end for introduction of said spinal implant into the spine, an opposite trailing end, spaced apart sides therebetween, and a mid-longitudinal axis passing through said leading and trailing ends;

opposite upper and lower surfaces between said leading and trailing ends and said spaced apart sides, said upper surface adapted for placement in engagement with the bone of one of the vertebral bodies and said opposite lower surface adapted for placement in engagement with the bone of the other of the vertebral bodies when said implant is placed between the adjacent vertebral bodies; and

a plurality of surface projections formed on said upper and lower surfaces of said implant, each of said surface projections having a base with a maximum width and a maximum length greater than the maximum width, the maximum width of said base being transverse to the maximum length of said base, at least a first and a second of said surface projections each having a peak, at least one forward facing facet directed at least in part toward said leading end, at least one rearward facet directed at least in part toward said trailing end, and opposed side facets directed generally toward said sides of said implant, said side facets being located between said forward facet and said rearward facet, each of said forward facet and rearward facet having a length and a slope, the length of said forward facet being longer than the length of said rearward facet, the slope of said rearward facet being steeper than the slope of said forward facet, said forward facet having a maximum length as measured along a line parallel to the maximum length of said base, the maximum length of said forward facet being

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

greater than the maximum length of said base, said at least one forward facet and said at least one rearward facet converging at said peak, said rearward facet having a perimeter with a first side and a second side, said first and second sides of said perimeter being in a convergent relationship and having a first included angle therebetween proximate said peak, said forward facet having a perimeter with a first side and a second side, said first and second sides of said perimeter being in a convergent relationship and having a second included angle therebetween proximate said peak, said first included angle being greater than said second included angle.

Claims 220-227 (cancelled).

- 228. (previously presented) The spinal implant of claim 219, wherein said upper and lower surfaces of said implant are at least in part arcuate.
- 229. (previously presented) The spinal implant of claim 219, wherein at least one of said leading end, trailing end, and sides are curved.
- 230. (previously presented) The spinal implant of claim 219, wherein said sides are curved.
- 231. (previously presented) The spinal implant of claim 219, wherein each of said leading end, trailing end, and sides are curved.
- 232. (previously presented) The spinal implant of claim 231, wherein said leading end, trailing end, and sides form a circle.
- 233. (previously presented) The spinal implant of claim 219, wherein said upper and lower surfaces of said implant are at least in part planar.
- 234. (previously presented) The spinal implant of claim 219, wherein said upper and lower surfaces converge toward each other along at least a portion of the length of said implant.
- 235. (previously presented) The spinal implant of claim 219, wherein said implant comprises a material other than bone.

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

- 236. (previously presented) The spinal implant of claim 219, wherein said implant comprises bone.
- 237. (previously presented) The spinal implant of claim 236, wherein said bone includes cortical bone.
- 238. (previously presented) The spinal implant of claim 219, wherein said implant comprises bone growth promoting material.
- 239. (previously presented) The spinal implant of claim 238, wherein said bone growth promoting material is one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
- 240. (previously presented) The spinal implant of claim 219, wherein said implant is treated with a bone growth promoting substance.
- 241. (previously presented) The spinal implant of claim 219, wherein said implant is a source of osteogenesis.
- 242. (previously presented) The spinal implant of claim 219, wherein said implant is at least in part bioabsorbable.
- 243. (previously presented) The spinal implant of claim 219, wherein said implant comprises metal.
- 244. (previously presented) The spinal implant of claim 243, wherein said metal includes titanium.
- 245. (previously presented) The spinal implant of claim 219, wherein said implant comprises at least one of a plastic material and a ceramic material.
- 246. (previously presented) The spinal implant of claim 219, wherein said implant is formed of a porous material and a material that intrinsically participates in the growth of bone from one of the adjacent vertebral bodies to the other of the adjacent vertebral bodies.
- 247. (previously presented) The spinal implant of claim 219, wherein said implant is a motion preserving device adapted to space apart and allow motion between the adjacent vertebral bodies.

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

248. (previously presented) The spinal implant of claim 219, wherein said spinal implant is a fusion implant.
249. (previously presented) The spinal implant of claim 248, wherein said upper and lower surfaces include at least one opening to permit bone growth from adjacent vertebral body to adjacent vertebral body through said implant.
250. (previously presented) The spinal implant of claim 248, wherein said implant has an internal chamber and an access opening for accessing said internal chamber.
251. (previously presented) The spinal implant of claim 250, wherein said upper and lower surfaces include at least one opening in communication with said internal chamber to permit bone growth from adjacent vertebral body to adjacent vertebral body through said implant.
252. (previously presented) The spinal implant of claim 250, wherein said internal chamber is capable of containing bone growth promoting material.
253. (previously presented) The spinal implant of claim 252, wherein said bone growth promoting material is one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
254. (previously presented) The spinal implant of claim 219, further comprising at least one opening capable of retaining fusion promoting materials.
- Claims 255-258 (cancelled).
259. (previously presented) The spinal implant of claim 1, wherein said first and second surface projections each have opposed side facets directed generally toward said spaced apart sides of said implant, respectively, said side facets being located between said forward facet and said rearward facet of each of said first and second surface projections, said side facets converging toward each other in a direction away from one of said upper and lower surfaces of said implant.
260. (previously presented) The spinal implant of claim 259, wherein said opposed side facets intersect each other.

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

- 261. (previously presented) The spinal implant of claim 260, wherein said opposed side facets converge to form a peak at the top of said surface projection.
- 262. (previously presented) The spinal implant of claim 261, wherein said peaks of at least two of said surface projections are aligned along lines that are at least one of perpendicular, parallel, and diagonal to the mid-longitudinal axis of said implant.
- 263. (previously presented) The spinal implant of claim 261, wherein said peak of said first surface projection overlies at least a portion of said second surface projection.
- 264. (previously presented) The spinal implant of claim 261, wherein said peaks of said first and second surface projections are at the same height above one of said upper and lower surfaces of said implant.
- 265. (previously presented) The spinal implant of claim 259, wherein adjacent side facets of adjacent surface projections are spaced apart to define a groove therebetween.
- 266. (previously presented) The spinal implant of claim 259, wherein a plurality of adjacent surface projections are spaced apart to form a plurality of grooves therebetween.
- 267. (previously presented) The spinal implant of claim 266, wherein at least one of said grooves is parallel to the mid-longitudinal axis of said implant.
- 268. (previously presented) The spinal implant of claim 266, wherein at least two of said grooves cross each other.
- 269. (previously presented) The spinal implant of claim 266, wherein at least one of said grooves has a horizontal cross-sectional shape that is one of a v-shape, u-shape, and a box-like shape.
- 270. (previously presented) The spinal implant of claim 259, wherein each of said first and second surface projections have a base and said side facets have a maximum width therebetween at said base, said base being spaced apart from a

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

base of another of said surface projections by a distance no greater than one-half the maximum width of one of said first and second surface projections.

271. (previously presented) The spinal implant of claim 1, wherein said forward facets of each of said first and second surface projections face the same direction.

Claims 272-276 (cancelled).

277. (previously presented) The spinal implant of claim 219, wherein said side facets converge toward each other in a direction away from the base of said first and second projections.
278. (previously presented) The spinal implant of claim 277, wherein said opposed side facets converge to form a peak at the top of each of said surface projections.
279. (previously presented) The spinal implant of claim 278, wherein said peaks are aligned along lines that are at least one of perpendicular, parallel, and diagonal to the mid-longitudinal axis of said implant.
280. (previously presented) The spinal implant of claim 277, wherein adjacent side facets of adjacent surface projections are spaced apart to define a groove therebetween.
281. (previously presented) The spinal implant of claim 277, wherein a plurality of adjacent surface projections are spaced apart to form a plurality of grooves therebetween.
282. (previously presented) The spinal implant of claim 281, wherein at least one of said grooves is parallel to the mid-longitudinal axis of said implant.
283. (previously presented) The spinal implant of claim 281, wherein at least two of said grooves cross each other.
284. (previously presented) The spinal implant of claim 281, wherein at least one of said grooves has a horizontal cross-sectional shape that is one of a v-shape, u-shape, and a box-like shape.

Application No. 09/921,844
Amendment dated October 5, 2010
Reply to Final Office Action of April 5, 2010

285. (previously presented) The spinal implant of claim 1, wherein said forward facet of said second surface projection is adjacent said rearward facet of said first surface projection.
286. (previously presented) The spinal implant of claim 281, wherein said base of said first surface projection is adjacent said base of said second surface projection.
287. (new) The spinal implant of claim 219, wherein said forward facing facet, said rearward facet and said side facets of said first and second surface projections are each triangular in shape.
288. (new) The spinal implant of claim 287, wherein said side facets have the same dimension.
289. (new) The spinal implant of claim 259, wherein said forward facing facet, said rearward facet and said side facets of said first and second surface projections are each triangular in shape.
290. (new) The spinal implant of claim 289, wherein said side facets have the same dimension.
291. (new) The spinal implant of claim 1, wherein said surface projections each have a peak, said at least one forward facing facet and said at least one rearward facet converging at said peak, said rearward facet having a perimeter with a first side and a second side, said first and second sides of said perimeter being in a convergent relationship and having a first included angle therebetween proximate said peak, said forward facing facet having a perimeter with a first side and a second side, said first and second sides of said perimeter being in a convergent relationship and having a second included angle therebetween proximate said peak, said first included angle being greater than said second included angle.